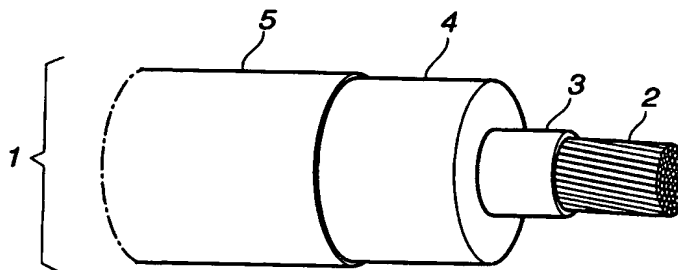




## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<b>(51) International Patent Classification <sup>6</sup>:</b> <b>H02J 3/36</b>	<b>A3</b>	<b>(11) International Publication Number:</b> <b>WO 97/45907</b> <b>(43) International Publication Date:</b> 4 December 1997 (04.12.97)
<b>(21) International Application Number:</b> PCT/SE97/00878 <b>(22) International Filing Date:</b> 27 May 1997 (27.05.97)  <b>(30) Priority Data:</b> 9602079-7           29 May 1996 (29.05.96)           SE 9700335-4           3 February 1997 (03.02.97)           SE  <b>(71) Applicant (for all designated States except US):</b> ASEA BROWN BOVERI AB [SE/SE]; S-721 83 Västerås (SE).  <b>(72) Inventors; and</b> <b>(75) Inventors/Applicants (for US only):</b> LEIJON, Mats [SE/SE]; Hyvlargatan 5, S-723 35 Västerås (SE); GERTMAR, Lars [SE/SE]; Humlegatan 6, S-722 26 Västerås (SE).  <b>(74) Agents:</b> DAHLSTRAND, Björn et al.; Asea Brown Boveri AB, Patent, Stockholm Office, S-120 86 Stockholm (SE).		<b>(81) Designated States:</b> AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, CZ (Utility model), DE, DE (Utility model), DK, DK (Utility model), EE, ES, FI, FI (Utility model), GB, GE, GH, HU, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ARIPO patent (GH, KE, LS, MW, SD, SZ, UG), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).  <b>Published</b> <i>With international search report.</i> <i>Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i>  <b>(88) Date of publication of the international search report:</b> 15 January 1998 (15.01.98)

(54) Title: ROTATING ELECTRICAL MACHINE PLANTS



## (57) Abstract

The present invention relates to installations for transformerless generation of HVDC and wherein the installation comprises rotating high-voltage single-winding/multiple-winding machines and converters. The single-winding/multiple-winding machine comprises a magnetic circuit with one or more magnetic cores and one or more windings, phase-shifted in space, which comprise a cable with one or more current-carrying conductors (2), each conductor comprising a number of strands, around each strand there being arranged an inner semiconducting layer (3), around which is arranged an insulating layer (4) of solid insulation, around which is arranged an outer semiconducting layer (5).

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## INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 97/00878

## A. CLASSIFICATION OF SUBJECT MATTER

IPC6: H02J 3/36

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: H02J

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

WPI

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 3305225 A1 (BBC AKTIENGESELLSCHAFT BROWN, BOVERI & CIE), 16 August 1984 (16.08.84), page 3, line 34 - page 4, line 4, figures 1,3,4, claim 1, abstract --	1-15
A	US 4429244 A (P.Z.NIKITIN ET AL), 31 January 1984 (31.01.84), column 1, line 10 - line 58 --	1-15, 30, 31
A	US 5036165 A (R.K.ELTON ET AL), 30 July 1991 (30.07.91), figure 1, abstract	15
X	--	21-31

☒ Further documents are listed in the continuation of Box C.☒ See patent family annex.

\* Special categories of cited documents:

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"O" document referring to an oral disclosure, use, exhibition or other means

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"&amp;" document member of the same patent family

Date of the actual completion of the international search

24 Nov 1997

Date of mailing of the international search report

25 -11- 1997

Name and mailing address of the ISA /

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## INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 97/00878

## C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5111095 A (J.R. HENDERSHOT), 5 May 1992 (05.05.92), figures 4A,4B --	32,38
X	EP 282876 A2 (KOLLMORGEN CORPORATION), 21 Sept 1988 (21.09.88), figure 1 --	33
X	EP 0677915 A1 (KOLLMORGEN CORPORATION), 18 October 1995 (18.10.95), figure 2, abstract --	35
X	SU 955369 A (GJK), 18 November 1997 (18.11.97), figures 1-4	34,36,37
A	--	29,38
A	EP 0120154 A1 (TRENCH ELECTRIC, A DIVISION OF GUTHRIE CANADIAN INVESTMENTS LIMITED), 3 October 1984 (03.10.84), figure 3 -- -----	26

# INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE97/00878

## Box I Observations where certain claims were found unsearchable (Continuation of Item 1 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:  
because they relate to subject matter not required to be searched by this Authority, namely:
  
2. ☒ Claims Nos.: 16-20  
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:  
  
See next sheet!
  
3. ☐ Claims Nos.:  
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

## Box II Observations where unity of invention is lacking (Continuation of Item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

See next sheet!

1. ☒ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
  
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest



The additional search fees were accompanied by the applicant's protest.



No protest accompanied the payment of additional search fees.

# INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 97/00878

## Box I

Claims 16-20 relate to a "Rotating single winding/multiple winding machine". These claims, however, are directly hierarchically dependent of claim 15, which relates to an "Installation comprising a converter and a rotating machine". This makes the scope of protection sought unclear and therefore no meaningful search can be carried out regarding these claims (PCT, Article 17(2)(a)(ii)).

## Box II

The claims represent nine different inventive concepts:

- I: The invention is defined in claims 1-15 and relates to installations comprising electrical motors and converters capable of transforming mechanical torque into direct current and vice versa without utilising intermediate transformers.
- II: The invention is defined in claims 21-31 and relates to electrical machines with windings, comprising conductors surrounded by two semiconducting layers having an interposed insulating layer.
- III: The invention is defined in claim 32 and relates to an electrical machine with a core comprising salient poles and further comprising windings, phase-shifted in space.
- IV: The invention is defined in claim 33 and relates to an electrical machine with an air-gap winding.
- V: The invention is defined in claim 34 and relates to an electrical machine with radial air-gap flux.
- VI: The invention is defined in claim 35 and relates to an electrical machine with axial air-gap flux.
- VII: The invention is defined in claim 36 and relates to a method for manufacturing an electrical machine comprising a flexible winding.
- VIII: The invention is defined in claim 37 and relates to a method for manufacturing an electrical machine comprising windings in the form of a cable, which is threaded into the stator of the machine.
- IX: The invention is defined in claim 38 and relates to a method for manufacturing an electrical machine comprising windings in the form of a cable. The machine includes salient poles around which the cable is wound.

The requirement of unity of invention is fulfilled only when there is a technical relationship among the inventions involving one or more of the same or corresponding special technical features. The special technical features shall also define a contribution which the claimed inventions, considered as a whole, makes over the prior art (PCT, Rule 13).

The claimed inventions do not fulfil this requirement and therefore unity of invention is lacking.

**INTERNATIONAL SEARCH REPORT**  
Information on patent family members

01/10/97

International application No.  
PCT/SE 97/00878

Patent document cited in search report			Publication date	Patent family member(s)	Publication date
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				JP 7298589 A	10/11/95
				✓ US 5646467 A	08/07/97
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